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Introduction

As long as there has been crime humanity has sought to understand the origins of the criminal act. Throughout the centuries of human existence many theories have emerged as to what causes the criminal to behave the way that he does. Some have even theorized as to whether there is a biological component to criminal activity. Now that the human genome has been mapped and society moves to further unlock the mysteries that our DNA holds, a focus on whether genetics are a factor in criminality has emerged. While there is no "crime gene" it has become clear that genes play a role in behavior, and in criminal behavior[1]. These new inquires as to the genetic roots of criminality create a myriad of questions in policy, ethics, criminology, and law regarding how this information should be used. These questions are especially sensitive in light of how society thinks of the correlation between genetics and crime due to the history of genes and behavior in American law. The current policies and societal attitudes toward the science of human genetics and crime cannot be understood without reference to the eugenic era, the last time society attempted to set policy based on the connection of the heredity and behavior.

Twenty-One years ago, genetics had begun to reemerge as a possible factor in crime and a number of individuals from across the academic spectrum were interested in

[1] Daniel Goleman, *New Storm Brews On Whether Crime Has Roots in Genes*, THE NEW YORK TIMES, Sept. 15, 1992, available at http://www.nytimes.com/1992/09/15/science/new-storm-brews-on-whether-crime-has-roots-in-genes.html (last visited May 9, 2013).

discussing the implications of this new trend.[2] A conference entitled "Genetic Factor in Crime: Findings, Uses and Implications" was scheduled to take place at the University of Maryland on October 9th, 1992.[3] The purpose of this conference was to "[identify and] clarify the methodological, legal, and ethical issues raised by the development and use of the techniques for identifying and treating criminal predispositions [.][4]" This conference never took place. The National Institutes of Health (hereinafter "NIH") withdrew the funding amidst controversy that the conference revived the discredited theory of eugenics.[5] The NIH claimed that the program too readily accepted and gave credence to the notion that violence and crime had genetic causes.[6] This notion that genes were the determining factor regarding criminal behavior and other societal ills was a central tenet of eugenics, it was this idea that fueled many of the worst aspects of the eugenic era.[7]

The notion that one's genes play a role in determining whether a person will commit a crime cannot be honestly discussed without an understanding of Eugenics. During the late 19th and early 20th century the eugenics movement assumed that genes, or heredity, determined behavior.[8] The eugenic movement led several prominent members of society, inspired by Darwin's *Origin of Species*[9] and the rediscovery of Gregor Mendel's lost work on genetic inheritance[10], to attempt to improve society by manipulating the composition of the human race through selective breeding. Eugenics encouraged both the reproduction between those possessing positive traits and the

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2 *Id*.
3 *Id*.
4 *Id*.
5 *Id*.
6 *Id*.
7 *See* PHILIP R REILLY, EUGENICS, ETHICS, STERILIZATION LAWS, ENCYCLOPEDIA OF ETHICAL, LEGAL, AND POLICY ISSUES IN BIOTECHNOLOGY 204 (Thomas H. Murray & Maxwell J. Mehlman eds., 2000).
8 *See id*.
9 *Id*.
10 *Id*.

elimination from the gene pool of people possessing perceived negative traits.[11] As the aforementioned article shows, the legacy of these programs shapes much of the way society currently thinks about genetics and crime.

As the cancellation of this conference demonstrates, scientists and criminologists are apprehensive about identifying genetic factors that could be a partial cause of crime due to eugenics. Eugenics casts a large shadow over the science of human genetics, especially where one is searching for biological factors that could possibly be a factor in criminal behavior. However, modern behavioral genetics is not eugenics rebooted and rebranded. Behavioral genetics is a new way of thinking about how genetics affect behavior. Behavior genetics focuses on more than just a person's genetic composition but also on the environmental factors that contribute to behavior.[12] Modern thinking in regards to genetic predisposition has developed and the resulting studies are making their way into the courtroom.

This paper will explore the development of the use of genetic predisposition in criminal law in the United States by examining its past use during the eugenic era, the 1970s XXY insanity defense cases, and modern cases involving genetic predisposition as a mitigating factor in sentencing. This paper then draws analogs between the emerging field of neuroscience and it's application in criminal law to aid in understanding how emerging sciences that use biological information can be used in a criminal proceeding.

Part I of this paper recounts the history of Eugenics and it's use in American law, explaining the origins and aspirations of this pseudoscience. This section also explains how a lofty idea, unsupported by data and hardly scrutinized by the judicial branch, lead

11 *Id.*
12 ROBERT PLOMIN, BEHAVIORAL GENETICS IN THE POSTGENOMIC ERA 10-14 (Plomin et al. ed., 2003).

to what we consider an ugly part of our country's history. Part I concludes with a brief explanation of how this era shapes our thinking regarding the interplay between genetics and crime. Part II continues by explaining basic principles of behavioral genetics and drawing a distinction between behavioral genetics and the discredited theory of eugenics. Part II goes on to explain how the courts have received information based on studies of behavioral genetics, continuing with an exploration of XYY syndrome and the fad of introducing studies regarding XYY as and insanity defense. Part II then moves on to explore successful and unsuccessful introductions of behavioral genetic studies as a mitigating offense in sentencing concluding with an examination of Ineffective Assistance of Counsel claims based on a failure to introduce this evidence.

Next, Part III contrasts the acceptance of behavioral genetics in criminal trials with courts acceptance of evidence of behavioral neuroscience, focusing on the differences between neuroscience and behavioral genetics. Finally Part IV concludes by arguing for the court to be cautious of introducing genetic information into criminal proceedings based on the unclear nature of genetics causal relationship to specific behavior, the legacy of the eugenic era and the potential pitfalls of introducing information of this sort, and the necessity of consistent application of the law in light of ever changing nature of scientific understanding. Scientific advancements based our every increasing knowledge of genetics could soon cement genetic factors as cause to specific behavior. This paper suggests that until the role that genetics plays in causing criminal behavior is clear and accepted, this information should be subject to scrutiny when introduced into criminal proceedings. That courts need to be wary in admitting

evidence of this sort lest this information be turned against criminal defendants or a improper decision be made based on a study that could soon be discredited.

I. Three Generations of Criminals: A Brief Historical Overview of Eugenics in The United States

To those that study genetics eugenics is a dirty word used to describe a disgraceful era of American history. However, the founders and proponents of eugenics did not set out to cause harm to those that would eventually suffer due under eugenic policies during the late 19th and early 20th century. Eugenics was thought to be a vehicle in which society could eliminate social ills and thus make the world a better place for all. Eugenics was very aspirational in nature, one of mankind's many attempts to improve the human condition.[13] However here, the best of intentions led to great harm.[14]

The word eugenics derives from a combination of two Greek words and means "well-born".[15] Sir Francis Galton, best known for his work in statistics, coined the term to describe the subject that he developed in the late 1880's. Likely inspired by his cousin Charles Darwin's publication of *Origin of Species*, Galton began researching heredity by observing the aristocracy in London.[16] Galton determined that the success of those he studied was not due to societal privilege or economic opportunity but rather due to their good breeding.[17] Galton published his findings in his book *Inquiries into Human Faculty and Its Development*.[18] *Inquiries into Human Faculty and Its Development* advocated that society should encourage marriages between those individuals that were deemed to have

13 ALLEN BUCHANAN ET AL., FROM CHANCE TO CHOICE 27-28 (Buchanan et al. eds., 2001).
14 *See* Reilly, *supra* note 7, at 10.
15 *Id.*
16 *Id.*
17 *Id.*
18 *Id.*

superior traits in order to improve the human race.[19] This was a form of positive eugenics; Galton sought to improve humanity by encouraging those with inborn positive qualities to breed with one another. Thus Galton defined his new theory "as the science which deals with all influences that improve the inborn qualities of a race; also with those that develop them to the utmost advantage."[20]

Galton's ideas were further developed by the rediscovery of Gregor Mendel's work on genetics in plants and other independent duplication of his work.[21] Eugenicists fused Galton's desire to improve the species with a very base level understanding of genetic inheritance. Eugenicists believed that behavior, whether socially useful or socially deleterious, was inherited from a person's ancestors in the same way that a person inherits hair or eye color. Thus, eugenicists believed that traits such as alcoholism, mental disability, and criminality, were directly caused by a person's genetic makeup.[22] This conclusion developed into a belief that in order to improve the human race and eliminate the social problems that plague society that those with bad genes needed to be eliminated from the gene pool.[23].

This idea, while abhorrent to the majority of use living in the 21st century, was popular in the United States and abroad at the time it was introduced. Eugenics attracted the attention of many prominent people that we still hold in high esteem today.The Rockefellers and Andrew Carnegie, among others, supplied funds for eugenic programs.[24] Enjoying popular support and holding the promise of a better society,

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19 *Id.*
20 *Id.*
21 *Id.*
22 *See id.*
23 *See id.*
24 Buchanan et al., *supra* note 13, at 28.

eugenics was quickly incorporated into the American legal system. Laws that sought to encourage reproduction amongst those possessing desired traits, and seeking to remove the deleterious elements in society, took many forms. Anti-miscegenation laws, segregation, laws prohibiting the marriage of disabled people, strict immigration controls, and most notoriously the forced sterilization of people deemed immoral, poor, or disabled are just a few examples of laws introduced in the United States during the eugenic era.[25]

The most notorious of all these laws are those that involved forced sterilization. Indiana enacted the nation's first sterilization bill in 1907,[26] however the law was not in effect for long. After only two years of sterilizations the governor issued a moratorium[27] on any more sterilizations and the law was later struck down by the Indiana Supreme Court on 14th amendment due process grounds.[28] However, numerous other states also passed similar sterilization laws and soon sterilization of those deemed undesirable was common in the United States.[29] Compulsory sterilizations reached the Supreme Court in 1927 when the Court heard *Buck v. Bell*. The majority opinion, authored by Oliver Wendell Holmes, upheld the forced sterilization statute of the mentally disabled on public welfare grounds.[30] This case is the origin of the oft quoted phrase "[t]hree generations of imbeciles are enough" that so well summarizes the thinking of the eugenic era.[31]

Sterilization was not just for the mentally ill or socially unacceptable, sterilizations were also performed on those who were deemed to be habitual criminals.

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[25] James E. Bowman, *The Road to Eugenics*, (1996) (paper given at Chicago Law School's symposium: Genetics and the Law: The Ethical, Legal, and Social Implications of Genetic Technology and Biomedical Ethics), available at http://law-roundtable.uchicago.edu/s05.html#5.
[26] Reilly, *supra* note 7, at 204.
[27] *Id*.
[28] Williams v. Smith, 190 Ind. 526, 131 N.E. 2 (1921).
[29] Reilly, *supra* note 7, at 204.
[30] Buck v. Bell, 274 U.S. 200, 207, 47 S. Ct. 584, 585, 71 L. Ed. 1000 (1927).
[31] *Id*.

Unlike *Buck v. Bell*, when the United States Supreme Court heard *Skinner v. State of Oklahoma* in 1942, Oklahoma's sterilization program for habitual offenders did not survive constitutional scrutiny.[32] The Oklahoma law ordered the mandatory sterilization of those having committed three or more crimes involving moral turpitude; the Court found this law to be unconstitutional on equal protection grounds.[33] The Court also based its opinion on the fact that marriage and procreation are fundamental rights stating: "We are dealing here with legislation which involves one of the basic civil rights of man. Marriage and procreation are fundamental to the very existence and survival of the race. The power to sterilize, if exercised, many have subtle, far-reaching and devastating effects. In evil or reckless hands it can cause races or types which are inimical to the dominant group to wither and disappear."[34]

The Court's warning in *Skinner* regarding the disappearance of groups inimical to the majority soon proved true. Nazi Germany soon became the world's leading nation in the practice of eugenics.[35] Nazi Germany's eugenic programs resulted in the extermination of millions of Jews, Jehovah's witnesses, homosexuals, disabled people, and other groups deemed deleterious to German society.[36] Due to the atrocities committed by the Nazis and the recognition that eugenics was at least partially motivated by racist and class bias, the use of genetic information regarding predisposition to behavior, criminal or otherwise, slowly died out and was relatively untouched for

[32] Skinner v. State of Okla. ex rel. Williamson, 316 U.S. 535, 537, 62 S. Ct. 1110, 1111, 86 L. Ed. 1655 (1942).
[33] *Id*.
[34] *Id*. at 541.
[35] Reilly, *supra* note 7, at 14.
[36] *Id*.

decades.[37] As the aforementioned cancellation of the 1992 conference on the relationship between genetics and crime shows, the eugenic legacy still looms large when recognition is paid to the fact that genes influence behavior. However the idea that there is a connection between genes and behavior is not dead, a new scientific field of inquiry has evolved, behavioral genetics, which studies what impact genes on human behavior.[38]

II. The Second Life of Genes and Behavior: An Overview of Behavioral Genetics and its Use in Criminal Proceedings

A. The Basics

A full definition of the science behavioral genetics is beyond the scope of this article, however a simple understanding of the science is essential to understand the differences between this new field of study and eugenics. Behavioral genetics is a field of study concerned with the effects of genetics and hereditary factors on behavior.[39] However scientists practicing in this field recognize that genes do not actually control behavior, environmental factors also play a role.[40] Further behavioral geneticists do not believe that a single gene controls behavior, but rather that behavior is influenced by a number of genes working together.[41] Researchers in the field use twin studies, adoption studies, family studies, and animal studies in their search to understand the inheritance of behavioral traits.[42]

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[37] *See* Roberta M. Berry, *From Involuntary Sterilization to Genetic Enhancement: The Unsettled Legacy of Buck v. Bell*, 12 NOTRE DAME J.L. ETHICS & PUB. POL'Y 401 (1998).

[38] *See* Plomin, *supra* note 12, at 10.
[39] *Id*.
[40] *Id*.
[41] STEVEN E. HYMAN, USING GENETICS TO UNDERSTAND HUMAN BEHAVIOR IN WRESTLING WITH BEHAVIORAL GENETICS: SCIENCE, ETHICS, AND PUBLIC CONVERSATION 113, 113-16 (Erik Parens, Audrey R. Chapman & Nancy Press eds., 2006).
[42] *Id*.

B. Eugenics v. Behavioral Genetics

Most importantly for the purposes of this paper, we must understand what behavioral genetics is not. Unlike eugenics, behavior genetics does not have an aspirational goals to improve society. The purpose of behavioral genetics is to understand the role genes play in specific behaviors; behavioral geneticists are not trying to build a utopia by controlling reproduction.[43]

As stated above, behavioral genetics does not assume that genes completely determine a person's behavior.[44] Behavior genetics also takes into consideration environmental factors.[45] Thus, the belief that someone will automatically exhibit social harmful behavior due to an ancestor engaging in such behavior does not exist in behavioral genetics as it did in eugenics.[46] Heredity is not to be discounted as completely irrelevant in determining behavior however. Behavioral geneticists, similarly to eugenicists, look to a person's family history as part of their research when trying to determine the causes of certain behaviors.[47]

This is all to say that causation is not presumed as it was with eugenics. Of the many differences between eugenics and behavioral genetics, this is the most important. Eugenicists believed that because a person had certain genes they would engage in behavior.[48] Behavioral geneticists believe that genes merely play a contributory role in determining whether someone will engage in a behavior.

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[43] MARK A. ROTHSTEIN, BEHAVIORAL GENETIC DETERMINISM: ITS EFFECTS ON CULTURE AND LAW IN BEHAVIORAL GENETICS: THE CLASH OF CULTURE AND BIOLOGY 89, 89-96 (Ronald A. Carson & Mark A. Rothstein eds., 1999).
[44] *See* Hyman *supra* note 41, at 115.
[45] *See id*.
[46] *See id*.
[47] *Id*.
[48] *See* Reilly, *supra* note 7, at 204.

C. Behavioral Genetics in the Courtroom

1. The 1970's XYY Insanity Fad

The 1970s saw a new fad emerge regarding of the use of genetic information being introduced in criminal trials. Genetic information was reintroduced following studies published in the 1960s that suggested a link between a XYY syndrome and aggressive or criminal behavior.[49] Defense attorneys soon sought to use these studies to help prove an insanity defense, that the victim did not possess the moral understanding or capacity to conform his action to the requirements of the law, based on their clients having been diagnosed with XYY syndrome.

The purpose of the insanity defense is to ensure that only those that have the mental capacity to commit a criminal offense are held responsible for a criminal act.[50] A person is not responsible for a criminal act if he was insane at the time the criminal act took place.[51] A person who was insane at the time of the criminal act is not capable of being deterred from additional criminal activity due the condition that caused their diminished capacity.[52] Such a person is not subject to the same penalties that would be imposed on a criminal defendant that is not insane.[53] Defense attorneys attempted to prove that their clients lacked capacity due to symptoms related to XYY syndrome.

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[49] W. H. Price & P. B. Whatmore, *Behaviour Disorders and Pattern of Crime amoung XYY Males Identified at a Maximum Security Hospital*, 1 BRIT. MED. JOURNAL 1, 533-36 (1967).
[50] 41 Am. Jur. Proof of Facts 2d 615 § 1.
[51] *Id.*
[52] *Id.*
[53] *Id.*

XYY syndrome is a genetic abnormality in which a male inherits an extra Y chromosome resulting in a total of 47 chromosomes instead of the usual 46.[54] This abnormality occurs in an average of 1 out of every 1000 male births.[55] XYY has physical and mental characteristics. On the physical side, those who have the extra chromosome tend to grow at a faster rate as children and achieve greater than expected average heights.[56] XYY syndrome can also manifest itself in an increased rate of learning disabilities and a lower average IQ than siblings who do not possess the extra chromosome, but not a lower average IQ generally.[57] Most importantly for our purposes XYY studies also claimed a correlation between the syndrome and antisocial, aggressive, or criminal behavior.[58] These studies have mostly been discredited at the time of the writing of this paper.[59] However, when these studies were introduced the studies had yet to be discredited and defense attorneys saw an opportunity to use these claims to aid their client's defense.

Due to the claimed correlation between XYY syndrome and criminal behavior, defense attorneys sought to use their client's diagnoses as a means of proving legal insanity. The prevalent standard for insanity in the state is the M'Naghten Rule.[60] The M'Naghten Rule standard states that;

> "[T]o establish a defense on the ground of insanity, it must be clearly proved that, at the time of the committing of the act, the party accused was labouring under such a defect of reason, from disease of the mind, as not

[54] U.S. National Library of Medicine, *47,XYY Syndrome*, Genetics Home Reference (Revised Jan. 2009), http://ghr.nlm.nih.gov/condition/47xyy-syndrome (last visited May 9, 2013).
[55] *Id*.
[56] *Id*.
[57] *Id*.
[58] *See* Price & Whatmore, *supra* note 49, at 534.
[59] ZSOLT HARSANYI & RICHARD HUTTON, GENETIC PROPHECY: BEYOND THE DOUBLE HELIX, 188-89 (Rawson Associates 1981).
[60] 41 Am. Jur. Proof of Facts 2d 615 § 1.

> to know the nature and quality of the act he was doing; or, if he did know it, that he did not know he was doing what was wrong."[61]

This is to say that only those with the capacity to understand the basic wrongness of there act are deemed to have the capacity to form the criminal intent necessary to be held culpable for the criminal acts they have engaged in. This standard does not define what insanity is, but it is the standard that must be met in order for a criminal defendant to escape responsibility for their criminal behavior due to a mental defect.[62]

Courts have uniformly rejected the theory of correlation between XYY and insanity.[63] The primary reasons for the rejection stems from the fact that the studies offered up into evidence were insufficient to prove that XYY syndrome was the cause of the criminal activity.[64] However, the courts were reluctant to categorically prohibit genetic predisposition as a possible defense, simply holding that in these cases the evidence was not enough.[65] The cases below illustrate three states court's insistence on the need to prove the causal link between the genetic disorder and the criminal act.

XXY syndrome was first used in an attempt to establish an insanity defense under the M'Naghten test illustrated above. In *People v. Tanner*, the defendant submitted a motion to change his plea after a judgment of conviction based on his assertion that he was legally insane at the time of the assault.[66] The defendant summited expert testimony and the XYY studies arguing that those that suffer from XYY syndrome have higher

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[61] M'Naghten's Case, 10 Clark & Finnelly 200, 210, 8 Eng Rep 718, 722 (HL 1843).

[62] 41 Am. Jur. Proof of Facts 2d 615 § 1.
[63] *See* 42 A.L.R.3d 1414.
[64] *See id.*
[65] *See id.*
[66] People v. Tanner, 13 Cal. App. 3d 596, 596 (Ct. App. 1970).

levels of aggression.[67] The defendant's position was that he was legally insane at the time of the assault as a result of his genetic condition. After an evidentiary hearing, the trial court denied the defendant's motion.[68]

In rejecting the evidence as insufficient, the Court held that while the testimony of the expert witnesses suggested that aggression was only one of many manifestations of XYY, the evidence did not suggest that all people with XYY were by nature involuntarily aggressive.[69] The Court also relied on the fact that some males with XYY syndrome do not exhibit aggressive behavior.[70] The Court also decided that the expert could not show XXY was the cause of the defendant's aggressive behavior nor established whether XYY would satisfied the M'Naghten test.[71] In light of the deficiencies, the appellate court held that the trial court did not abuse its discretion in denying the defendant's motion.[72]

Almost simultaneously with *Tanner,* XXY was put forward to help establish a v insanity defense in Maryland.[73] In *Millard v State* the defendant appealed a guilty verdict on the grounds that he was insane based on his having XYY syndrome and the resulting in increased aggressiveness and propensity toward criminal behavior.[74] Millard's lone expert witness testified that persons with XYY "had marked antisocial, aggressive and schizoid reactions, and were in continual conflict with the law."[75]

The Court held, much like the court in *Tanner*, that while the expert witness's testimony "tended to show, in a general way, that XYY caused him to become antisocial,

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[67] *Id*. at 598.
[68] *Id*. at 599.
[69] *Id*. at 600.
[70] *Id*. at 601.
[71] *Id*. at 603.
[72] *Id*. at 604.
[73] Millard v. State, 8 Md. App. 419 (1970).
[74] *Id*.
[75] *Id*. at 422.

aggressive, in continual conflict with the law, and have a propensity toward crime", this showing was insufficient to rebut the presumption of sanity.[76] Further the court held that "a mental defect" was not by itself enough to fulfill the test for insanity.[77] Again, XYY failed to establish an insanity defense due to lack of causal evidence between the conduct and an failure to meet the requirements of the state's test for insanity.

Five years later XYY was once again submitted to the court in an effort to establish a M'Naghten insanity defense. Here the New York Court held that in New York

> "an insanity defense based on chromosome abnormality should be possible only if one establishes with a high degree of medical certainty an etiological relationship between the defendant's mental capacity and the genetic syndrome. Further, the genetic imbalance must have so affected the thought processes as to interfere substantially with the defendant's cognitive capacity or with his ability to understand or appreciate the basic moral code of his society."

The Court also cited the fact that not all of those diagnosed with XYY appear to have a propensity for violence.[78]

As the above-examined cases illustrate, courts have left the door open to the possibility of a chromosomal abnormality being used as the basis of an insanity defense and laid out certain criteria for such a defense. These cases seem to suggest that an insanity defense based on genetic abnormality has a very high bar to clear in regards to the causal requirement. Beyond what is necessary to prove an insanity defense, the proponent of such a defense must prove that the abnormality to have caused the criminal behavior.

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[76] *Id.* at 426.
[77] *Id.*
[78] People v. Yukl, 372 N.Y.S.2d 313, 370 (Sup. Ct. 1975).

New York also added the specification that the causal relationship must be proved with a high medical certainty.[79] This case, in the same way as the previously discussed cases, failed due to the defendant's inability to prove the causal relationship coupled with the inability of the defendant to prove the test for an insanity defense.[80]

From the cases examined above, it becomes clear that even though there was some scientific evidence put forth at the time to establish XYY syndrome resulted in increased aggressiveness and constant conflict with the law, this scant evidence of genetic predisposition was not enough to eliminate culpability in criminal behavior. Simply put the scientific information failed to show the necessary causal relationship to the commission of the criminal acts at issue.

While XYY failed to prove an insanity defense, the state courts discussed here have not foreclosed genetic information from being presented at a criminal trial. In order for the insanity defense to be successful one must not only prove the insanity test applicable to the jurisdiction but also must prove that there is a causal relationship between the genetic abnormality and mental capacity.[81] This focus on the causal relationship suggests skepticism towards the use of genetics as an excuse for criminal behavior, and presents a marked difference from the basic eugenic assumption that we are just a product of our genes.

2. Behavioral Genetics as a Mitigating Factor

While behavior genetics have had little success in establishing an insanity defense, defense attorneys have had more success in presenting behavioral genetics as a

[79] *See id.*
[80] *See id.*
[81] *Id.*

mitigating factor in sentencing.[82] Unlike an insanity defense, mitigation does not seek to excuse a defendant's criminal behavior due to lack of requisite capacity. [83] The purpose of mitigation is to satisfy the individualized sentencing requirement of the Eighth Amendment's prohibition against cruel and unusual punishment in capital trials.[84] The defense attorney's reason for presenting mitigation factors is to convince the sentence that something beyond the defendant's control contributed to the commission of the crime.[85]

A. The Warrior Gene

The most famous case involving a defendant producing genetic information in an attempt to mitigate criminal charges is that of *State v. Waldroup*.[86] The outcome of this case sparked a firestorm in the media leading to headlines such as "Pity the poor murderer, his genes made him do it"[87] The Tennessee Grand Jury indicted the defendant in the case on "two counts of especially aggravated kidnapping, one count of first degree murder, and one count of attempted first degree murder. He was eventually convicted on one count of aggravated kidnapping, one count of especially aggravated kidnapping, voluntary manslaughter, and attempted second-degree murder.[88] The conviction stemmed from an incident when Waldroup prevented his wife and her friend from leaving their home. Waldroup attempted to kill his wife shooting her in the back as she

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[82] *See* State v. Waldroup, E2010-01906-CCA-R3CD, 2011 WL 5051677 (Tenn. Crim. App. Oct. 20, 2011), *appeal granted* (Apr. 2, 2012).
[83] Jeffrey L. Kirchmeier, *A Tear in the Eye of the Law: Mitigating Factors and the Progression Toward A Disease Theory of Criminal Justice*, 83 OR. L. REV. 631, 632 (2004)
[84] *See* Woodson v. North Carolina, 428 U.S. 280, 305 (1976).
[85] *See* Kirchmeier, *supra* note 83, at 634.
[86] Waldroup, *supra* note 82, at 17.
[87] Nigel Barber P.H.D., *Pity the Poor Murderer, His Genes Made Him Do It*, PSYCHOLOGY TODAY, July 13, 2012, available at http://www.psychologytoday.com/blog/the-human-beast/201007/pity-the-poor-murderer-his-genes-made-him-do-it (last visited May 9, 2013).
[88] *Id*.

was fleeing and beating her with a shovel.[89] Waldroup also killed his wife's friend, Leslie Bradshaw, by shooting her eight times with a 22-calier rifle and slicing her head open with a machete.[90]

During the trial, Waldroup's attorneys ordered a test that established he had a genetic disorder affecting the production of Monoamine oxidase A.[91] The MAOA gene governs production of Monoamine oxidase A, a dysfunction with behavioral effects occurs when the gene fails to produce enough monoamine oxidase A.[92] This condition is colloquially known as the warrior gene.[93] The disorder that occurs due to the dysfunction of this gene coupled with a history of childhood abuse is associated with antisocial, violent, or criminal behavior in European Americans.[94] Waldroup successfully put forth the genetic anomaly coupled with the fact that he was abused as a child in order to diminish his mens rea in the commission of the crime.[95] As a result Waldroup was only convicted of a second-degree murder and not murder in the first degree.[96] Second-degree murder in Tennessee is differentiated from first-degree murder in that a second-degree murder conviction involves a knowing killing of another[97] while first-degree murder requires a premeditated or intentional killing of another.[98] Waldroup received a total sentence of 32 years in prison based on his conviction,[99] while Tennessee's punishment

[89] *Id*.
[90] *Id*.
[91] Waldroup, *supra* note 82, at 18.
[92] Genetics Home Reference MAOA, available at http://ghr.nlm.nih.gov/gene/MAOA (last visited May 9, 2013).
[93] Barber, *supra* note 87, at 18.
[94] *Id*.
[95] *Id*.
[96] *Id*.
[97] Tenn. Code Ann. § 39-13-210 (West).
[98] Tenn. Code Ann. § 39-13-202 (West).
[99] Barber, *supra* note 87, at 18.

for first-degree murder is death, imprisonment without the possibility of parole, or imprisonment for life.[100]

Introducing the Warrior Gene as evidence has not always had such a favorable outcome for defendants. The outcome of *Waldroup* should be contrasted with that of the earlier case of *Turpin v. Mobley.* In *Turpin v. Mobley,* Mobley's attorneys presented evidence that four generations of the Mobley family had engaged in acts of violence or aggression.[101] Members of the Mobley family had been involved in crimes ranging from rape and murder to simple antisocial conduct.[102] Mobley's attorneys also introduced an article published regarding aggressive tendencies and MAOA deficiency.[103] The article presented evidence that the MAOA deficiency was a genetic abnormality that was passed from mother to son and had a role in regulating aggression.[104] At the time this article was relatively new and was nearly the sole paper on the subject.[105]

The trial court did not allow the defendant to be tested for the MAOA deficiency because of the lack of any causal relationship between the genetic disorder and the crime committed.[106] Mobley appealed this decision to the Supreme Court of Georgia. The Court affirmed the appellate court's decision based on the causation grounds.[107]

The most significant difference between these two cases is how established the validity of MAOA studies were. The *Mobley* case took place only one year after the publication of the paper finding a correlation between decreased MAOA production and a

[100] Tenn. Code Ann. § 39-13-202 (West).
[101] Turpin v. Mobley, 269 Ga. 635, 643 (1998).

[102] *Id.*
[103] *Id.* at 642.
[104] *Id.*
[105] *Id.*
[106] *Id.* at 643.
[107] Turpin, *supra* note 101, at 636.

propensity for violence.[108] *Waldroup* was tried after the MAOA paper had existed for nearly 20 years and had become established.[109] The courts skepticism in *Mobley* to allowing MAOA evidence is likely due to the article's status as having only been recently published.[110] The comparison between these two cases shows that the courts are unwilling to risk an erroneous decision based on new science that could soon be discredited.

B. Ineffective Assistance of Counsel Claims

Defendant's have also sought relief from criminal convictions by putting forward ineffective assistance of counsel claims based on their attorney's failure to submit evidence of genetic disorders with behavioral aspects during the sentencing phase of their trials. These claims have usually been unsuccessful.

In *Schriro v. Landrigan*, the Supreme Court heard a claim of this nature. In *Landrigan*, the respondent sought an ineffective assistance claim based on the fact that his lawyer had failed to proffer any biological information relating to his violent behavior as a mitigating factor.[111] The 9th circuit found that Landrigan had a colorable ineffective assistance claim due to the fact that counsel "did little to prepare for the sentencing aspect of the case," and that investigation would have revealed a wealth of mitigating evidence, including the family's history of drug and alcohol abuse and propensity for violence.[112]

The Court of Appeal's opinion in the case stated that it was highly doubtful that the sentencing court would have been moved by the family history of violence.[113] As the

[108] *Id.*
[109] See Turpin, *supra* note 101, at 643.
[110] *Id.*
[111] Landrigan v. Stewart, 272 F.3d 1221 (9th Cir. 2001), *opinion adopted sub nom.*, Landrigan v. Schriro, 501 F.3d 1147 (9th Cir. 2007).
[112] *Id.*
[113] Landrigan v. Schriro, 501 F.3d 1147 (9th Cir. 2007).

basis of this finding the Court of Appeals cited an Illinois Supreme Court opinion that spoke to the same issue.[114] The Illinois Supreme Court had stated that the defendant's offered evidence of psychological problems and his family's violent history was not inherently mitigating.[115] The Court went further and stated that evidence of this sort could actually be a double-edged sword for the defendant.[116] The jurors may have taken this evidence as proof that the defendant would be dangerous in the future, he would be less deterrable and that society needed to be protected from him.[117]

The Supreme Court reversed and remanded holding that the trial court did not abuse it's discretion citing the initial Court of Appeals opinion as part of the reasoning.[118]

> "The prospect was chilling; before he was 30 years of age, Landrigan had murdered one man, repeatedly stabbed another one, escaped from prison, and within two months murdered still another man. As the Arizona Supreme Court so aptly put it when dealing with one of Landrigan's other claims, '[i]n his comments [to the sentencing judge], defendant not only failed to show remorse or offer mitigating evidence, but he flaunted his menacing behavior.' On this record, assuring the court that genetics made him the way he is could not have been very helpful. There was no prejudice."[119]

Here the Supreme Court made no finding as to the merits of the genetic information that was to be introduced.[120] Rather, Justice Thomas writing for the majority endorsed the Court of Appeals opinion that the genetic evidence would not be very helpful to Landrigan.[121] The Supreme Court's endorsement of the Court of Appeals opinion, based on the *Franklin* decision, suggests that it was unwilling to entertain an

[114] Landrigan v. Stewart, 272 F.3d 1221 (9th Cir. 2001).
[115] *Id.*
[116] *Id.*
[117] People v. Franklin, 167 Ill. 2d 1, 23, 656 N.E.2d 750, 760 (1995).
[118] Schriro v. Landrigan, 550 U.S. 465, 127 S. Ct. 1933, 167 L. Ed. 2d 836 (2007).
[119] Landrigan v. Stewart, 272 F.3d 1221 (9th Cir. 2001).
[120] Schriro v. Landrigan, 550 U.S. 465, 127 S. Ct. 1933, 167 L. Ed. 2d 836 (2007).
[121] *Id.*

ineffective assistance of council claim when there is no strong causal relationship between the genetic information the defendant desires to be proffered and the criminal activity.

The three types of cases discussed above exhibit the concerns about using this type of information in the courtroom. In the XYY cases we can see that the causal link between genetic disorders and behavior is not clear. Further, the later disproval of the claims involved in the studies the defendant's relied on illustrates how untested science, if admitted, could lead to an unjust result. The MAOA mitigation cases also focus on this concern. Courts were reluctant at first to use MAOA studies to mitigate while a later court allowed the information in after the science had become more established. Finally the *Landrigan* case is an example of concerns regarding genetic information being used against the defendant. If behavioral genetics has a place in the courtroom something must be done to keep these issues from arising. However other biological issues that share some of these same concerns have found more success in criminal proceedings. One such field are behavioral neuroscience.

III. Neuroscience Difference in Acceptance, Use in The Courtroom

A. The Basics

Behavioral Neuroscience is the study of neurobiology and how it impacts behavior. It is a combination of the biology of the brain, neurobiology, and the functions of the brain, psychology. Scientists practicing in this field use neuroimaging and other methods to monitor brain activity. Scientists then map the areas corresponding to specific activities and behavior. From this information scientists can understand how conditions in

the brain affect behavior. Behavioral neuroscience simply explained is the science that study of how the biology of the brain affects behavior.

B. Behavioral Genetics v. Neurosciene

Like behavioral genetics, cognitive neuroscience has it's origins in a discredited pseudoscience, phrenology.[122] Phrenology, unlike eugenics, did not gain popular acceptance and laws were never enacted based on the claims phrenology made.[123] Thus, cognitive neuroscience does not have the same specter hanging over it that behavioral genetics does. The absence of a legacy of atrocities means that the questions regarding policy, ethics, and law concerning cognitive neuroscience are not as controversial as those concerning behavioral genetics.

The most significant difference between neuroscience and behavioral genetics is that there is no interplay between intangible factors in the former as there are in the latter.[124] Behavioral genetics looks to both genetic factors and environmental factors in seeking to explain a person's behavior.[125] The relationship between the brain and behavior in neuroscience is much more clear-cut. A neuroscientist need simply look at a section of the brain and it's function to understand what the behavioral ramifications of anomaly could be.[126] This is not to say that other factors do not play a role, however the relationship between brain function and behavior is less nebulous than the relationship

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[122] *See* Donald Simpson, *PHRENOLOGY and the NEUROSCIENCES: CONTRIBUTIONS of F. J. GALL and J. G. SPURZHEIM*, 2005 ANZ J. OF SURGERY (2005).

[123] *See* O. Carter Snead, *Neuroimaging and the 'Complexity' of Capital Punishment*, 82 NEW YORK U. L. REV. 1265, 1265-1339 (2007).

[124] *Id.*

[125] *Id.*

[126] *Id.*

between genes and behavior. That is to say that when it comes to proving that a certain condition caused a behavior, the causal relationship is much more clear.

C. Neuroscience in the Courtroom

Because cognitive neuroscience can be used to help understand why a person engages in behavior it is also can be useful when predicting what kind of behavior a person engage in. This includes criminal behavior, and thus has an application in criminal law as either defense or mitigating factor. Defendants have introduced neuroscience evidence for a number of reasons. Similar to the XYY insanity defenses mentioned above, studies relating to cognitive neuroscience and neuroimaging have been introduced to aid in establishing an insanity defense.

In *Com v. Monico,* the defendant introduced evidence through an expert witness regarding brain injuries and frontal lobe dysfunction as a basis of an insanity defense.[127] The expert testified that due to the defendant's frontal lobe dysfunction he did not believe that he could conform his behavior to the requirements to what the law required.[128] The basis of this testimony was a number of tests that were performed on the defendant coupled with basic neurological science supporting the diminished capacity of an individual with brain damage and a concussion.[129] The court held that this testimony alone was sufficient to necessitate the offering of an insanity instruction to the jury.[130]

Neuroscience has also been admitted as a mitigating factor in sentencing. In *Cooper v. State* the appellant appealed a death sentence where brain damage had been

[127] Com. v. Monico, 396 Mass. 793, 797 (1986).
[128] *Id*. at 799.
[129] *Id*. at 800.
[130] *Id*.

submitted as a mitigating factor.[131] Cooper suffered from frontal lobe dysfunction that resulted in poor impulse control.[132] The Court on review found the death sentence to be disproportionate to the crime on the basis that many mitigating factors were presented, including the evidence of frontal lobe dysfunction that implied lessened responsibility.[133]

In *People v Morgan,* the Supreme Court of Illinois vacated a death sentence based on the fact that the defendant's trial counsel's failure to introduce mitigating evidence of an organic brain damage coupled with an abusive childhood was enough to establish an ineffective assistance of counsel claim.[134] Here the defendant claimed that counsel was ineffective due to his failure to investigate his medical background and present information regarding organic brain damage during the sentencing phase of the trial.[135] The Court discussed that had the defendant's trial attorney conducted "minimal investigation, he would have learned of defendant's life-long brain damage, history of seizures, and other neurological impairments from medical records, school records, and defendant's criminal file."[136]

From the above cases we see that the court is not as concern about the relationship between the neurological disorder and the criminal behavior. This concern is not present due to the fact that causation in this science is much less nebulous than in behavioral genetics. Further these studies are established so there is less concern about making a incorrect judgment. Finally, the possibility of this information being used as a double

[131] Cooper v. State, 739 So. 2d 82, 83 (Fla. 1999).
[132] *Id.*
[133] *Id.*
[134] People v. Morgan, 197 Ill. 2d 404, 414 (2001).
[135] *Id.*
[136] People v. Morgan, 187 Ill. 2d 500, 540, (1999).

edged sword is also present but does not seem to be as much of an issue due to the fact that behavioral neuroscience does not have the same legacy as eugenics.

IV. Behavioral Genetics' Future in Criminal Trials; Protecting the Courts, Society, and Defendants

The skepticism that courts have shown toward the introduction of evidence regarding behavioral genetics is a useful in determining the problems that this type of information presents. First behavioral genetics is a new science and the studies that it produces can change. This is evidenced by the XYY studies.[137] Here courts have been skeptical towards allowing this information in until it becomes scientifically established. The courts reluctance in *Mobley* is an example of such.[138] Second, the causal relationship between a genetic abnormality and behavior is very nebulous and it can be difficult to determine whether the genetic condition caused the criminal behavior. Nearly all of the example cases seem to mention this fact. Third, and most importantly in light of the eugenic era, genetic information with behavioral aspect could work as a double-edged sword against defendants. Information of this sort could lead to a jury or judge imposing a longer sentence based on an assumption that the condition leaves the defendant unable to be rehabilitated.

Despite these fears, preventing any sort of behavioral genetics evidence due to fears of repeating past mistake would certainly lead to injustice., Courts must admit evidence regarding the circumstances surrounding criminal behavior in order to come to a just result. However, freely admitting scientific evidence that is not tested or too distant from the crime could undermine confidence in courts. Also when the question is about

[137] *See* W. H. Price & P. B. Whatmore, *supra* note 49 at 533.
[138] *See* Turpin, *supra* note 101, at 643.

what kind of behavioral genetics information is to be admitted there are concerns stemming from the eugenic era. The framework applied to admitting evidence of behavioral genetics must factor in all of these competing interests; scientific reality, causal relationships, integrity of the courts, and protections for the criminal defendant.

This approach begins by requiring the clear establishment of a causal relationship between the genetic condition and the criminal activity at issue as we see in the behavioral neuroscience cases. The court begins by scrutinizing the studies submitted by contrasting them to other studies such as the way the courts did in the XYY insanity cases. This may lead courts into an area of which they are unfamiliar and unqualified to rule on. To protect from these problems both the prosecution and the defense should be allowed to introduce expert testimony regarding the validity of the studies at issue and the court should make findings as to the sufficiency of the causal relationship between the genetic condition, the environmental factors, and the criminal activity. Courts uninformed by experts in the field run the risk of making an erroneous ruling as to admit or deny evidence of this sort. The experts protect the court from this risk by informing the court while allowing each side to present their own expert preserves the adversarial nature of our criminal justice system.

Next, this approach requires judges to consider how established these studies are. While there is already a standard as to what type of expert testimony can be admitted,[139] due to the history and the nature of the correlation between genes and crime courts should be more skeptical in admitting this information. Thus, courts should scrutinize behavioral genetics study's under a standard similar to the *Frye* "general acceptance"

[139] Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 582, 113 S. Ct. 2786, 2791, 125 L. Ed. 2d 469 (1993).

standard.[140] This standard would prevent the risk of admitting studies too early after their discovery. This would protect against erroneous studies, such as those submitted in the XYY cases, from creating unjust outcomes. This may seem like an extreme measure, however the legacy of eugenics reminds society of the caution needed when incorporating unverified theories into law and the injustice that can be created when courts refuse to scrutinize science.

Finally, courts should protect defendants from information of this sort being used to against the defendant during sentencing. Genetic information by its very nature suggests an unchanging nature, due to the majority of society understanding genes to be the blueprint of a person. Reflecting this reality courts should be sure to emphasize that a person's genes did not cause him to commit the criminal act, but they were merely a factor in what eventually caused the criminal behavior. In order to do this judges should submit jury instructions preventing sentencing juries from using a theory of genetic determinism to justify a stiffer sentence than they would have imposed absent the introduction of the genetic information.

This approach suggests that behavioral genetics studies can be introduced as evidence to aid a criminal defendant, however the hurdles that the evidence must clear protect several public interests. Requiring an established causal relationship and requiring the study to be generally accepted serve the purpose of ensuring that courts do not make erroneous decisions that undermine confidence in our criminal justice system. Further, prohibiting the sentencing jury or judge from considering genetic information as a factor to increase punishment protects the defendant from being sentenced for what he

[140] Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).

is instead of what he's done. Protecting both of these interests helps us to avoid the mistakes of the eugenic era. Requiring a clear causal relationship and scientific acceptance ensures that an embarrassing mistake like *Buck v. Bell* will never reoccur. Finally, protecting the defendant from having genetic information of this sort used against him prevents the atrocities of the eugenic era from ever repeating themselves.

Conclusion

As society begins to unlock the mysteries contained in our DNA new problems have emerged. As the eugenic era becomes more and more of a distant memory, scientists have become more accepting to the notion that genetics can play a part in determining whether or not someone will engage in criminal activity.[141] However the atrocities of eugenics still loom large over the entire proposition.[142] Concerns about repeating the mistakes of the eugenic era must be considered when introducing this information in criminal proceedings. Courts have been skeptical toward behavioral genetics to eliminate culpability and this trend should continue. However courts must allow this information to be submitted as evidence as it becomes clearer that genes do indeed have a role in criminal behavior. To disallow this information would to disregard an entire field of study simply due to its possible detriments.

These problems have not been an issue in regards to behavioral neuroscience. While neuroscience is a newer field of study, the field has been more readily accepted. The acceptance of this information forms the basic backbone of when courts should allow behavioral genetic information to be submitted as evidence in criminal trials.

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[141] Patricia Cohen, *Genetic Basis for Crime: A New Look*, THE NEW YORK TIMES, June 19, 2011, available at http://www.nytimes.com/2011/06/20/arts/genetics-and-crime-at-institute-of-justice-conference.html?pagewanted=all (last visited May 13, 2013).
[142] *Id.*

Because genetic information regarding behavior is more nebulous in terms of causation than cognitive neuroscience coupled with the legacy of eugenics, additional protections are needed. Courts should only admit genetic information of this type into evidence when there is a strong established causal relationship between the criminal act and genetic condition. Further, courts should wait until there is scientific verification and general acceptance of studies before this information is allowed due to the risk of an incorrect outcome that could undermine confidence in criminal proceedings and spark societal outrage. Finally defendants must be protected from this information being used against them in sentencing. To protect against this risk, courts and those submitting this evidence should be sure to ensure that the studies submitted are fully explained to those issuing the sentence. This explanation should include distinctions between the genetic information and the environmental circumstances that cause such behavior. Courts should also issue prohibitions against this evidence being used to enhance sentences, lest this information be used as sword against the defendant the submitted it.

Behavioral genetics certainly has a future in criminal proceedings. It would be a great injustice to categorically prohibit information of this sort. However protections need to be established to protect both the judicial process and the criminal defendant. As more studies of this nature emerge, our system must be able to incorporate these studies into criminal proceedings. With the proper protections in place we can avoid repeating the mistakes of the eugenic era while keeping our criminal justice system in sync with the reality that genes do indeed play some role in determining criminal behavior.